EARTH TECH – TECHNICAL MEMORANDUM

Date: 26 August 2008

To: Amy Darpinian – USACE

From: Mike Niederreither – Earth Tech AECOM

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Subject: Technical Memorandum No. 5
Treatability Study Results
Former Griffiss Air Force Base Land Farming Remediation
Contract No. W912DQ-08-D-0002, Delivery Order No. 0001

This Technical Memorandum has been prepared for the United States Army Corp of Engineers (USACE) to present the findings of a Treatability Study that was recently conducted on select biopiles soil samples collected as part of the preliminary soil sampling event. The purpose of the Treatability Study was to evaluate variables (e.g., moisture content and nutrient concentrations) important for conditioning land farmed soils to achieve optimum bioremediation of the residual volatile organic compounds (VOCs). The testing process also included laboratory analyses to evaluate physical soil characteristics and baseline contaminant concentrations.

1.0 Program Overview

The information provided in this Technical Memorandum provides a summary of testing recently conducted as part of the Biopile RA-O and Decommissioning project (Biopile RA-O) at the former Griffiss Air Force Base (Griffiss AFB) in Rome, New York. Activities described herein are in accordance with the requirements of the U.S. Army Corps of Engineers (USACE), Kansas City District, Contract Number W912DQ-08-D-0002, Delivery Order (DO) 0001 and applies only to activities performed by Earth Tech AECOM, (ET) and its subcontractors. The overall goal of this DO is to allow the U.S. Department of Defense (DOD) to attain complete environmental remediation and property transfer for all Base Realignment and Closure (BRAC) facilities, including Griffiss AFB.

1.1 Objectives

The objectives of Biopile RA-O remedial action for biopile soils staged and managed on Apron 1 were as follows:

1) Relocate all soils that require No Further Action (NFA) for reuse to other areas of the base.

2) Remediate soils to applicable regulatory standards or dispose off-site those soils that do not or will not meet New York State Department of Environmental Conservation (NYSDEC) Standards, Criteria and Guidance values (SCGs) as defined in the STARS Table 2 – Guidance Values for Fuel Oil Contaminated Soils.

1.2 Site Location and Description

Griffiss AFB is a former U.S. Air Force installation that encompasses 3,552 acres in the lowlands of the Mohawk River Valley in Rome, Oneida County, New York (see Figure 1). Griffiss AFB was activated in February 1942 as Rome Air Depot. The former base is located approximately 2 miles northeast of Rome, Oneida County, New York. The general location of Apron 1 in relation to the base is shown on Figure 1.

1.3 Site History and Conditions

As a result of historical JP-4, JP-8, and other fuel distribution and storage activities at the former Griffiss AFB, soil contamination identified at several locations within the installation was removed and transported to Apron 1 for remediation. Remedial actions of the petroleum-impacted soils at Apron 1 included ex situ bioremediation through land farming and later through biopiles. The goal of these cleanups has been to remediate the soils to below NYSDEC SCGs, as defined in STARS Table 2, so that the soils can be utilized onsite as clean fill. Analytical testing indicated that the primary chemical contaminants of concern were non-chlorinated VOCs and semi-volatile organic compounds (SVOCs).

Approximately 100,000 cubic yards (CY) of soil material was originally stockpiled on Apron 1, prior to implementation of the Biopile RA-O Work Plan. Figure 2 presents the original biopile configuration on Apron 1. These piles consisted of petroleum impacted soils generated from various base related construction and remediation project. Construction of the piles occurred at various times, extending from prior to 2001 into the spring/summer of 2003. With a few exceptions, the biopiles remedial action was largely successful in remediating soils to levels that were below NYSDEC SCGs.

2.0 Griffiss Biopile RA-O and Decommissioning Scope of Work

The overall approach to the Biopile RA-O project was broken down into five discrete steps

- On-site disposal of “clean” soils that, based on meeting NYSDEC SCGs and with concurrence with the NYSDEC, require NFA.
- Off-site disposal of all soils containing polynuclear aromatic hydrocarbon (PAH) compounds in excess of the STARS SCGs;
- Segregation of soil into “clean” piles (i.e., have met STARS SCGs) or VOC impacted piles for relocation to Apron 2 (i.e., have not met STARS SCGs);
- Further treatment of VOC impacted soils with bioremediation through the construction and operation of land farm cells on Apron 2. Figure 3 presents the current land farm soil configuration on Apron 2.

- By the end of the contract period (i.e., 2010), achieve a clean status designation for all land farmed soils (meet STARS SCGs); dispose of offsite soils that do not meet SCGs.

2.1 Land Farm Soil Treatability Study

An integral part of the Griffiss RA-O Project includes land farm remediation of VOC impacted soils in an attempt to attain NYSDEC SCGs for on-site reuse. As part of this remedial action, a Treatability Study (TS) was performed to evaluate variables (e.g., moisture content and nutrient concentrations) important for conditioning land farmed soils to achieve optimum bioremediation of the residual VOCs. VOC impacted soils designated for active land farming were collected and analyzed for pre-treatment biological analysis by ET's Biological Treatability Laboratory in Orlando, Florida.

Field Sampling Procedures

Treatability study soil samples were collected manually from a depth of approximately four feet from within selected biopiles using hand sampling equipment. The collected soils were placed into plastic 5-gallon pails equipped with polypropylene (or equivalent) bag-liners and snap-on lids. Plastic bag-liners were tall enough to allow the top of the bag to be closed with a twist tie as close to the top of the soil sample as possible. The pails were filled to approximately ¾ capacity. Soil samples were collected from zones representing high (biopile C10), medium-high (biopile C8) and low (biopile C15) VOC concentrations. Seven soil sample locations were used from both biopiles C8 and C10. One soil sample location representing low level VOC impacted conditions, without winterization measures, was used from biopile C15. A total of fifteen soil samples (i.e., 5-gallon pails) were submitted to the laboratory for testing purposes. Excess water was drained from the soils prior to placement in the pails. No preservation of the pails (e.g., on ice) was conducted.

Shipment and Receipt of Samples

Upon completion of the sampling effort, the polypropylene bags were tied shut and the lids were snapped on tightly and sealed. All fifteen pails were packaged and shipped to the Earth Tech Treatability Lab in Orlando, Florida. Upon receipt at the Treatability Laboratory, the soils were stored at room temperature and qualitatively evaluated. The logging process included a qualitative evaluation of the soils collected from each biopile. The log is included as attachment XXX. The results of the evaluation of the samples collected from biopiles C8 and C10 reported dark gray sandy to clayey soils, with some small stones, that were wet and exhibited strong petroleum odors (noted as gasoline by technician). The sample from biopiles C10 exhibited evidence what was observed to be sticks, bark, wood fragments, and roots within the noted soil matrix. This material is most likely related to the "winterization" that reportedly took place in biopiles C8 and C10. Winterization apparently involved mixing in organic materials, reportedly including manure, into the piles as they were constructed. The purpose of this would have been to provide nutrients and a heat source via decomposition to promote biodegradation. The sample collected from biopiles C15 reported similar soil characteristics as the two other biopiles, minus the organic material, including petroleum odors (noted as gasoline).

Baseline Sampling

Upon receipt, grab samples were collected from randomly selected buckets representing biopiles C8 and C10 and submitted to the University of Florida Soil Testing Laboratory in Gainesville, Florida for baseline characterization purposes. Baseline soil samples collected from C8 and C10 were analyzed for a specific set of analytical parameters including: VOCs, SVOCs, nitrate-nitrogen (nitrate-n), ammonia-nitrogen (ammonia-n), nitrite-nitrogen (nitrite-n), and Total Kjeldahl Nitrogen (TKN). TKN represents the sum total of all nitrogen sources present in a sample. Once the appropriate volume of sample was removed, the pails were resealed to preserve the sample reserves for later usage.

The baseline sampling program included testing of samples from biopiles C15. The samples from biopile C15 were used to provide a general (non-winterized) representation of the land farm soils on Apron 2. The analytical protocols included inorganic compounds and physical parameter testing.

Baseline Sampling Results

Soil samples from biopile C15 were tested to evaluate the physical properties of the soils, which will be used to represent the general nature of all soils actively being land farmed on Apron 2. Physical parameters measured include gravimetric moisture content (Table 1a), bulk density and porosity (Table 1b), and field capacity (Table 1c).

Table 1a - Gravimetric Moisture Determination

Sample ID	Saturated Sample Weight	Oven Dry Sample Weight	Saturated Gravimetric Moisture
	gms	gms	gram/gram
GAFB 15	222.09	194.23	27.86
GAFB 15B	218.94	196.28	22.66

Table 1b – Bulk Density and Porosity Determination

Sample ID	Oven Dry Weight	Ring Weight (Core Weight)	Cheese Cloth and Rubber Band	Oven Dry Weight	Volume of Core	Bulk Density			Porosity
	gms	gms	gms	gms	cm^3	gm/cm^3	lbs/ft^3	tons/CY	%
GAFB 15	194.23	68.59	1.8	123.84	68.7	1.80	112.4	1.51	31.98
GAFB 15B	196.28	72.95	1.7	121.63	68.7	1.77	110.5	1.49	33.19

Table 1c – Field Capacity Determination

Sample ID	Saturated Sample Weight	0.3 bars	Oven Dry Sample Weight	Ring Weight (Core Weight)	Cheese Cloth and Rubber Band	Field Capacity	Oven Dry Weight - Soil	Water Content	Moisture
	gms	gms	gms	gms	gms	gms	gms	gms	%
GAFB 15	222.09	208.33	194.23	68.59	1.8	137.94	123.84	14.1	7.26
GAFB 15B	218.94	206.46	196.28	72.95	1.7	131.81	121.63	10.18	5.19

The biopile C-15 sample provided to the laboratory was divided into two equal 68.7 cubic centimeter portions, each run separately. Results, provided in the above tables, indicated that the soil bulk density (dry weight basis) was approximately 1.8 grams per cubic centimeter (112 pounds per cubic foot; 1.512 tons per cubic yard) with an average porosity of 32.5 percent. Gravimetric moisture content was calculated to be on average 25 grams/grams, which equated to an average moisture content of approximately 6.25 percent. The field capacity of the soils (135 grams average) is the quantity of water held in the soil pores against the pull of gravity. Based on the sample volumes, this equates to a field capacity of 1.95 grams per cubic centimeter, which is consistent with silt (some clay) dominated soil matrix. The soil porosity suggests the soil is dominated by macropores (secondary porosity feature), which may result in preferential flow paths through the soil matrix.

The pooling of water on the surface of the land farm soils and the slow rate of water drainage observed following precipitation events provides further evidence that the primary matrix of these soils is comprised of silt. Smaller grained particles including silts and clays have more surface area than larger particles such as sand. The larger surface area, in turn, allows the soil matrix to hold and store more water (i.e., greater field capacity) because of the stronger capillary forces. The movement (drainage) of water by gravity through the soil pores (primary porosity) following a precipitation event is more limited than a soil matrix comprised predominantly of sand. The secondary porosity feature will be the main mechanism for water drainage and also oxygen distribution. Routine tilling of the land farm soils, in the absence of continual rainfall, will increase the secondary porosity, allowing the water to drain more freely and oxygen to be more evenly distributed. Table 2 presents the inorganic compounds analyzed from the biopiles C15 sample.

Table 2 – Inorganic Compound Testing Results (Biopile C15)

Sample Location	Date	pH	TOC	Boron	Copper	Iron	Manganese
GAFBC-15	04/25/08	8.0	2800	0.821 U	18.8	14500	503
GAFBC-15B	04/25/08	8.1	na	na	na	na	na

Sample Location	Date	Zinc	Phosphorous	Potassium	Magnesium	Calcium
GAFBC-15	04/25/08	34.4	46	27	157	>2272
GAFBC-15B	04/25/08	na	46	28	150	>2448

pH reported in standard units; all other concentrations in mg/kg

The pH in the two samples was determined to be approximately 8.0, which falls within the pH range for microorganism growth ranges of 6.0 to 8.5. The slightly alkaline condition of the soils is most likely a function of the calcium concentrations observed in the sampling results. The high calcium concentration (2,300 mg/kg average) may be due to the addition of lime during construction of the original biopiles. Lime is often added to improve handling and to generate heat, which is beneficial to the biodegradation process.

The analytical results also revealed that the concentrations of two key elements – phosphorus and potassium – are not limiting the growth of microorganisms. The reported concentrations indicate that there are ample quantities of these two elements to support bioremediation within the land farmed soils.

Another critical nutrient in the growth and development of microorganisms is nitrogen. As previously discussed, the analytical protocol for the C8 and C10 samples included a full suite of for nitrogen analyses. Table 3 presents the nitrogen analytical results.

Table 3 – Nitrogen Analytical Results – Biopiles C8 and C10

Sample Location	Date	Nitrate-N	Nitrite-N	Ammonia-N	TKN
GAFB-8	06/05/08	1.6	0.02 U	0.20	260
GAFB-10	06/05/08	0.06 U	0.02 U	0.11 U	1800

Concentrations reported in mg/kg

The analytical results presented in Table 3 indicate that the forms of nitrogen available for microorganism utilization (nitrate-n, nitrite-n and ammonia-n) are very limited in the soils from these two biopiles. Although the concentrations of these compounds are low or non-detect, the high TKN concentration indicates that some form of nitrogen is present. As previously noted, the TKN concentration represents the total sum of all nitrogen compounds in the sample. The high TKN values in the absence of the typical available forms of nitrogen (nitrate-n, nitrite-n, and ammonia-n) represent unavailable nitrogen (to microorganisms) that is most likely associated with organic materials (e.g., plant matter and manure) observed in the C8 and C10 soil samples. The inclusion of organic materials in these piles during construction was to provide available sources of nitrogen and heat in support of the bioremediation process. The absence of available nitrogen forms, in the presence of these organic materials, indicates that the available nitrogen sources have been utilized completely by the microorganisms. The absence of available nitrogen in these two biopiles considering they were provided with nutrients

during their construction suggests that nitrogen is likely limited in the remaining soils as well.

The final aspect of the baseline analytical study included VOC and SVOC analysis of samples from biopiles C8 and C10. As discussed, these two biopiles represented the two most residually impacted biopiles on Apron 1 and were therefore included in the TS program to determine the proper nutrient and moisture conditions required to ensure VOC bioremediation within the contract period. The initial baseline samples from biopiles C8 and C10 were collected by TS laboratory personnel and submitted to the analytical laboratory on 25 April 2008. As presented in Table 4, the VOC results reported from the baseline event were dramatically lower than expected from both samples.

Table 4 – VOC and SVOC Sampling Results (C8 and C10)

VOCs	GAFBC-10		GAFBC-8	
	4/25/08	**6/25/08**	**4/25/08**	**6/25/08**
1,2,4-Trimethylbenzene	0.0092	0.062	0.0048	0.0002 U
1,3,5-Trimethylbenzene	0.013	0.054	0.0062	0.0002 U
4-Isopropyltoluene	0.0005 U	0.075	0.0029	0.0002 U
Benzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
Ethylbenzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
Isopropylbenzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
MTBE	0.0044	0.0003 U	0.0004 U	0.0002 U
Naphthalene	0.0008 U	0.033	0.0006 U	0.0002 U
n-Butyl Benzene	0.0006 U	0.0004 U	0.0004 U	0.0002 U
n-Propyl Benzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
o-Xylene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
m,p-Xylenes	0.0036	0.0059	0.0008 U	0.0003 U
sec-Butylbenzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
tert-Butylbenzene	0.0005 U	0.0003 U	0.0004 U	0.0002 U
Toluene	0.0005 U	0.0003 U	0.0004 U	0.0002 U

Table 4 – VOC and SVOC Sampling Results (C8 and C10) - Continued

SVOCs				
Benzo(a)anthracene	0.045 I	NA	0.18	NA
Benzo(a)pyrene	0.030 I	NA	0.39	NA
Benzo(b)fluoranthene	0.034 I	NA	0.7	NA
Benzo(g,h,i)perylene	0.025 I	NA	0.16	NA
Benzo(k)fluoranthene	0.029 I	NA	0.28	NA
Chrysene	0.027 I	NA	0.3	NA
Dibenzo(a,h)anthracene	0.013 U	NA	0.051 I	NA
Fluoranthene	0.074	NA	0.57	NA
Fluorene	0.055 I	NA	0.031 I	NA
Indeno(1,2,3-cd)pyrene	0.027 I	NA	0.17	NA
Naphthalene	0.091	NA	0.036 I	NA
1-Methyl naphthalene	0.31	NA	0.24	NA
2-Methyl naphthalene	0.096	NA	0.083	NA
Phenanthrene	0.053 I	NA	0.028 I	NA
Pyrene	0.077	NA	0.46	NA

U – analyzed by not detected; I – reported value is between MDL and PQL
All concentrations in mg/kg

The SVOCs present in both samples were at relatively low concentrations as was expected based on historical sample analyses. The land farming program associated with the Biopile RA&O has specifically been designed to address VOC compounds, so elevated concentrations of SVOC compounds in these samples were not anticipated. Historical data from these two biopiles indicated total VOC concentrations ranging from an average of 80 mg/kg in biopile C8 to nearly 140 mg/kg in biopile C10. As presented in Table 4, the baseline analytical data indicated that total VOC concentrations from the samples collected from both biopiles were in the low µg/kg concentration range. To confirm these initial baseline results, a second set of samples was collected from the reserve volume of soil from biopile C8 and C10 and submitted to the analytical laboratory on 25 June 2008 for VOC analysis. Although the standard laboratory holding time for VOC analysis had expired, the purpose of this test was to provide a relative confirmation of the initial results. As presented in Table 4, the results of the confirmation event were generally consistent with the initial baseline results.

The difference between the historical VOC results and the TS sample VOC results is potentially the result of a couple of factors: 1) the samples collected from these biopiles did not accurately represent the true nature of the overall content of the biopiles, or 2) aeration and handling of soils during the initial sample event, their shipment, the physical evaluation process, and re-sampling for analytical purposes facilitated volatilization and rapid aerobic biodegradation of residual VOCs. As presented in the following bullets, it is more likely that these soils underwent volatilization and rapid aerobic biodegradation:

- Qualitative evaluations of soils upon receipt at the TS laboratory indicated that the samples collected from both biopiles C8 and C10 for TS laboratory testing exhibited strong petroleum odors.
- Qualitative evaluations of soils also identified residual organic matter in the form of manure and woody plant material in biopiles C8 and C10. This residual material is consistent with reports that these two biopiles were constructed with manure. The purpose of this application would have been to support nutrient needs and enhance the biodegradation process.
- The saturated anaerobic conditions of the biopiles would have effectively shutdown the aerobic degradation process. Aeration of this relatively small quantity of soil in the manner described above would have been thorough, and would have promoted volatilization of VOCs and rapid transition to aerobic conditions.
- Although nitrogen limited, in the presence of oxygen, the existing nutrients observed in these soils (C8 and C10) could have supported biodegradation.

Laboratory Bench-Scale Testing

Treatability testing of the land farm soils was originally planned to evaluate nutrient and moisture variables to facilitate conditioning of the land farmed soils to optimize biodegradation of residual VOCs. Testing was to be conducted in test cells or "Soil Pans" that were constructed for this purpose. The approach of the testing program was to subject equal volumes of biopiles soils from C8 and C10 to controlled moisture and nutrient concentrations in order to determine optimum bioremediation conditions. The design of the soil pans and the testing approach was developed to generally mimic the environmental condition of the land farmed soils on Apron 2. However, based on the less than ideal analytical results from the baseline sampling event discussed above, the TS laboratory recommended that the bench-scale bioremediation study be halted.

Nutrient Evaluation

To optimizing nutrient application and monitoring of the land farm itself, nutrient calculations have been made for the existing land farm soils. Based on the approximate total volume of land farmed soil (28,600 cubic yards) and the lab determined dry weight bulk density of 112 lbs/ft^3, the total weight of soil in the land farm is calculated to be:

$$28{,}600cy \times \frac{112lbs}{cft} \times \frac{27cft}{cy} = 86{,}486{,}400\ \mathrm{lbs}$$ (Approximately 43,243 tons)

Utilizing the lab determined TOC value of 2,800 mg/kg (0.28%), which was derived from biopiles C15, the approximate mass of carbon is expected to be on average:

$$43{,}243tons \times 0.28\% \cong 121tons$$

Based on a TOC concentration of 2,800 mg/kg and on a general bioremediation recommendation of 10:1 carbon to nitrogen ratio, the mass of nitrogen required to meet the carbon demand is:

$121 tons \times 0.1 Nitrogen \cong 12 tons N$

The calculated tonnage of nitrogen is based on the assumption that the TOC concentration of 2,800 mg/kg is consistent across all 28,600 cubic yards of soil on Apron 2. Based on the evaluations made for biopiles C8 and C10, it is likely that this concentration is low for the soils comprising these two biopiles.

Conclusions

Although the conclusion that the soils underwent volatilization and rapid aerobic biodegradation as a function of this process is circumstantial, in combination with the physical soil characteristics and available nutrients, it does suggest that land farming will be effective at meeting cleanup goals for the former biopile soils. The results of this study also revealed the following: 1) a critical nutrient (nitrogen) is limited and must be provided to ensure microbial health, growth and development, and 2) the land farm soils are comprised primarily of silt, which have a greater ability to store and hold water (high field capacity) than a sand dominated soil matrix. To effectively drain and aerate these soils to promote aerobic degradation, additional and frequent tilling of the soil will be required, and 3) the calculated TOC value most likely represents standard land farm soils on Apron 2 and may not accurately reflect the TOC content of biopiles C8 and C10, which were mixed with organic materials (e.g., manure) during their construction.

Recommendations

Based on the results of the TS, the following recommendations are being made:

1) Utilize the 2,800 TOC value to determine nitrogen needs for all soils on Apron 2 with exception of soils representing biopiles C8 and C10, which account for approximately 12,000 cubic yards of the total volume of soil on Apron 2. The revised nitrogen need calculation is as follows:

   a. $16{,}600 cy \times \frac{112 lbs}{cft} \times \frac{27 cft}{cy} = 50{,}198{,}400 \text{ lbs}$ (25,099 tons)

   b. $25{,}099 tons \times 0.28\% \cong 70 tons$ (organic carbon materials)

   c. $70 tons \times 0.1 Nitrogen \cong 7.0 tons$ (nitrogen)

2) Resample the soils related to biopiles C8 and C10 to confirm TOC concentrations in these soils and to confirm the accuracy of nitrogen demand. It is recommended that two samples from each zone be collected for TOC analysis (four total samples).

3) As weather permits, apply nitrogen based fertilizer to soils to address determined limitation. The specific nitrogen source and application protocol will be determined and presented to the USACE once a vendor is formally identified.

4) As dryer weather persists, reinstitute tilling to breakup and aerate soils to promote aerobic biodegradation. The frequency of tilling will depend on moisture content and tilling effectiveness with the silty soils.

PROJECT: GRIFFISS AFB 103159.12.10

Notebook No. ______
Continued From Page (1)

PM: Mike Niederwerther — Sampler: LPK / JRS

- 4/17/08 Samples received via FedEx freight @ 1-2:30 pm. 1300-1430

Matrix: Soil — Container: 15 5-gallon plastic Buckets.

- Logged in @ 1520
- pH and Soil Description BASELINE

Sample ID	Inhouse Sample ID	Sample Date	Sample Time	Field pH	Lab pH	Comments
C-801	GAFB ~~C801~~ -01	4/9/08	0850	7.37	7.46	Strong gasoline odor. dark grey soil
C-801	GAFB ~~C801~~ -02	4/9/08	0850	7.37	7.46	Stones present - dark grey
C-803	GAFB ~~C803~~ -03	4/9/08	1035	7.31	7.33	↓
C-803	GAFB ~~C803~~ -4	↓	↓	↓	7.33	Dark grey sandy - gasoline smell
C-803	GAFB ~~C803~~ -5	↓	↓	↓	7.42	↓
C-804	GAFB ~~C804~~ -6	4/9/08	0955	7.02	7.61	↓
C-804	GAFB ~~C804~~ -7	↓	↓	7.02	7.65	Sandy/stones
C-1001	GAFB ~~C1001~~ -8	4/9/08	1140	7.60	~~8.44~~ 8.45	All 04/18/08 Contains sticks, & bark, roots and wood
C-1001	GAFB ~~C1001~~ -9	↓	↓	↓	8.75	sticks, bark, wood, roots, gasoline smell grey soil
C-1001	GAFB ~~C1001~~ -10	↓	↓	↓	8.62	Sticks bark, roots, wood, gasoline & peat, grey soil. Strong
C-1002	GAFB ~~C1002~~ -11	4/9/08	1230	8.08	7.73	↓
C-1002	GAFB ~~C1002~~ -12	↓	↓	↓	7.78	↓
C-1003	GAFB ~~C1003~~ -13	4/9/08	1300	7.04	7.30	↓
C-1003	GAFB ~~C1003~~ -14	↓	↓	↓	7.44	↓
C-1504	GAFB ~~C1504~~ -15	4/8/08	1615	8.01	7.44	Sandy, light brown, clay, peat gasoline odor

Keep Sample ID as just GAFB-01, GAFB-02, GAFB-10 etc.
All 04/17/08.

- ~~Field Capacity~~ Composite piles: C-1504 - GAFB-15, GAFB #12, GAFB
Soil Moisture

Experiment Start: 1031 — Stop: 1325*

Start	A	Stop	Start	B	Stop	Start	C	Stop
↓	10 mins - High,	↓	↓	5 mins - Medium	↓	↓	5 mins - Medium	↓
1050	Medium	1100	1155		1200	1244		1253

* All dry crucibles

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Read and Understood By

Anne Karai-Abbott	04/17/08 / 04/18/08	A.K.	04/18/08
Signed	Date	Signed	Date

PROJECT # GRIFFISS AFB 103159.12.10

Notebook No. ______
Continued From Page ①

PM - Mike Niedermeier Sampler: LPK / JRS

04/17/08 Samples received via FedEx freight @ 1-2:30pm.
1300 - 1430

Matrix :- Soil Container :- 15 5-gallon plastic Buckets.

Logged in @ 1520

pH and Soil Description BASELINE

Sample ID	InHouse Sample ID	Sample Date	Sample Time	Field pH	Lab pH	Comments
8Q1	GAFB~~C801~~-01	4/9/08	0850	7.37	7.46	Strong gasoline odor. dark grey soil
8Q1	GAFB~~C801~~-02	4/9/08	0850	7.37	7.46	Stones present - dark grey
8Q3	GAFB~~C803~~-03	4/9/08	1035	7.31	7.33	↓
8Q3	GAFB~~C803~~-4	↓	↓	↓	7.33	Dark grey sandy - gasoline smell. wet
8Q3	GAFB~~C803~~-5	↓	↓	↓	7.42	↓
8Q4	GAFB~~C804~~-6	4/9/08	0955	7.02	7.61	↓
8Q4	GAFB~~C804~~-7	↓	↓	7.02	7.65	Sandy / Stones
10Q1	GAFB~~C10Q1~~-8	4/9/08	1140	7.60	~~8.44~~ 8.45 AK 04/18/08	Contains sticks, & bark, roots and wood
10Q1	GAFB~~C1001~~-9	↓	↓	↓	8.75	sticks, bark, wood, roots, grey soil, gasoline smell
10Q1	GAFB~~C1001~~-10	↓	↓	↓	8.62	Sticks bark, roots, wood, grey soil. Strong odor gasoline & wet, wood smell
10Q2	GAFB~~C1002~~-11	4/9/08	1230	8.08	7.73	↓
10Q2	GAFB~~C1002~~-12	↓	↓	↓	7.78	↓
10Q3	GAFB~~C1003~~-13	4/9/08	1300	7.04	7.30	↓
10Q3	GAFB~~C1003~~-14	↓	↓	↓	7.44	↓
-15Q4	GAFB~~C15Q4~~-15	4/8/08	1615	8.01	7.44	Sandy, light brown, clay - Slight gasoline odor

Change Sample ID to Just GAFB-01, GAFB-02, GAFB-10 etc.
AK 04/17/08.

~~Field Capacity~~ (only 3 picks) C-15Q4 - GAFB-15, GAFB#12, GAFB#3

Soil Moisture

Experiment Start: 1031 Stop: 1325*

Start	A	Stop	Start	B	Stop	Start	C	Stop
↓	10mins - High, Medium	↓	↓	5mins. Medium	↓	↓	5mins. Medium	↓
1050		1100	1155		1200	1244		1253

*All Dry Crucibles

Continued on Page ______

Read and Understood By

Anne Kanai-Abbott 04.17.08/04/18/08 AK. 04/18/08

Signed Date Signed Date

0' 1000' 2000'

APPROX. SCALE IN FEET

AERIAL PHOTOGRAPH PROVIDED BY ©2008 MICROSOFT LIVE SEARCH MAPS.

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FIGURE 1
BIOPILE RA–O
SITE LOCATION MAP

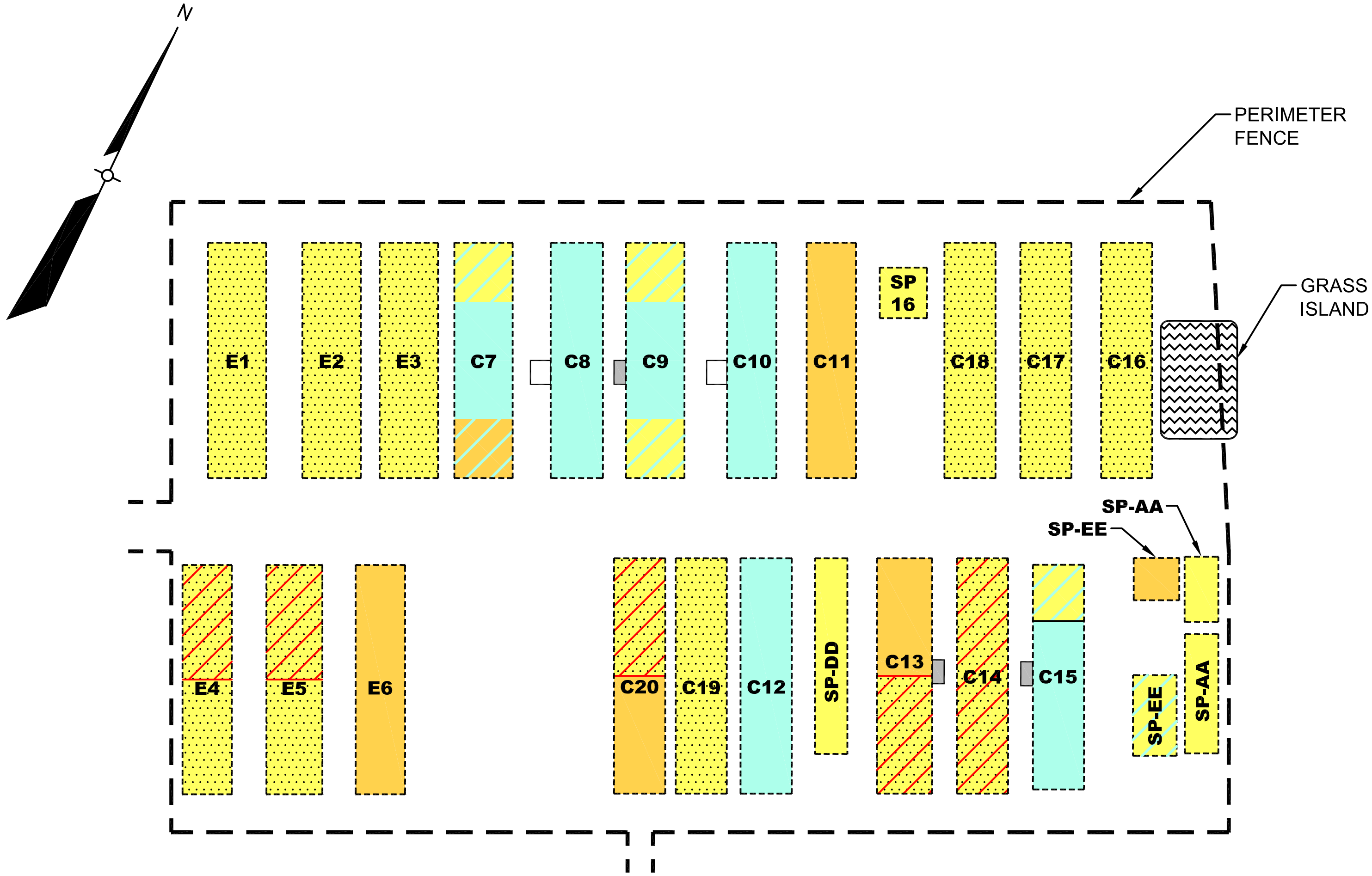
UNITED STATES AIR FORCE
FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

AUGUST 2008

103159

AUGUST 26, 2008

103159X001.DWG



LEGEND

E1 - E6	FIRST SIX BIOPILES CONSTRUCTED BY ECC (7/02 - 9/02)
E7 - C20	FINAL FOURTEEN BIOPILE CONSTRUCTED BY CAPE (10/02 - 8/03)
SP16	BLDG 789 STOCKPILE REMNANTS RELOCATED FROM TAXIWAY
AA, DD, EE	SOIL STOCKPILES BY OTHERS (PRE 2002)
	CLOSED BIOPILE
	ACTIVE BLOWER
	INACTIVE BLOWER
	EXISTING CLEAN SOILS
	RECENTLY APPROVED CLEAN
	INDICATED CLEAN BY ET NO FORMAL APPROVAL
	PAH IMPACTED SOILS-DISPOSAL APPROVED
	PAH IMPACTED SOILS-ANALYTICAL DATA REQUIRED
	VOC IMPACTED SOILS-IMMEDIATE LANDFARMING

BIOPILE KEY

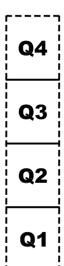


FIGURE DERIVED FROM CAPE ENVIRONMENTAL MANAGEMENT - APRON 1 SITE DIAGRAM, DATED SEPTEMBER 2006.

NOT TO SCALE

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FIGURE 2
BIOPILE RA-O
ORIGINAL BIOPILE CONFIGURATION
APRON 1

UNITED STATES AIR FORCE
FORMER GRIFFISS AIR FORCE BASE
ROME, NEW YORK

AUGUST 2008

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AUGUST 26, 2008

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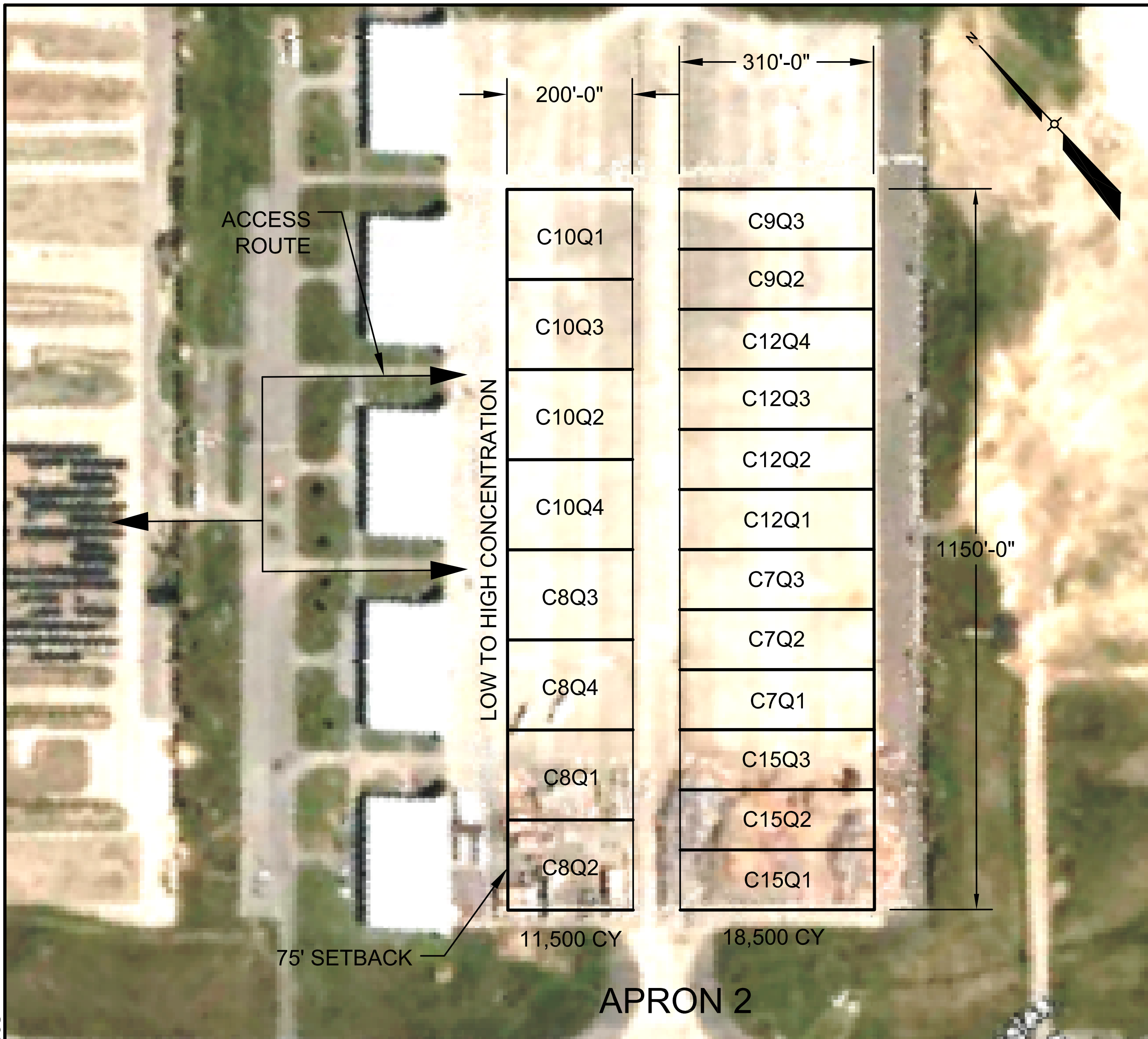

LEGEND

CY INDICATES SOIL CAPACITY IN DESIGNATED AREA

—— INDICATES EROSION CONTROL MEASURES

0' 125' 250' 500'

APPROX. SCALE

NOTE:

1. 10 FOOT SETBACK ASSUMED ON ALL SIDES OF AVAILABLE LANDFARMING AREAS.
2. ASSUMES LANDFARM ZONE THICKNESSES OF NO LESS THAN 1.5 FEET.
3. ACCESS ROUTE IS CONCEPTUAL - TO BE DETERMINED IN FIELD.
4. QUADRANTS C9Q1, C7Q4, C15Q4, AND C9Q4 ARE TENTATIVELY CLEAN BASED ON PRELIMINARY SAMPLING DATA.

IMAGE DERIVED FROM 2008 EUROPA TECHNOLOGIES. COORDINATES 43°13'3"N, 75°23'44"W.

AUGUST 26, 2008

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FIGURE 3
BIOPILE RA–O
CURRENT LAND FARM LAYOUT
APRON 2

UNITED STATES AIR FORCE
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